DISTRIBUTION OF AQUATIC DRYOPOIDEA (COLEOPTERA) IN MAINE[1]

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ABSTRACT: The distribution of aquatic dryopoid species in Maine is presented. Observations on distribution and habitat are summarized and mechanisms affecting distribution are discussed. Eight species are reported from the state for the first time.

Aquatic Dryopoidea are represented in Maine by four families: Elmidae, Dryopidae, Psephenidae, and Ptilodactylidae. Species belonging to these families form a characteristic element of the freshwater benthic fauna, particularly along actively flowing systems (LeSage and Harper 1975). Many species are sensitive to a variety of pollutants and are thus important as water quality indicators (Finni and Skinner 1975).

Eighteen dryopoid species have been reported from Maine by Brown (1972), Brown and Murvosh (1974), Brown and White (1978), Mingo, Courtemanch, and Gibbs (in press), Mingo (1978), and White (1978). However, the superfamily has received little attention in the state and comprehensive studies are lacking.

The present study was undertaken to examine the distribution of aquatic dryopoid beetles in Maine.

METHODS AND MATERIALS

Field collections were made from 160 locations. Primary sampling emphasis was placed on small streams and rivers having stony substrates using techniques described by Brown (1972). Large, deep rivers are poorly represented in this study due to sampling difficulty. Deliberate attempts were made to collect specimens from riffle areas, aquatic vegetation (including mosses) and submerged, decaying wood. Specimens bearing encrustations were cleaned with concentrated hydrochloric acid and by brushing with a fine, camel-hair paint brush as described by Brown (1972) and Hilsenhoff (1973). All specimens were preserved in the field in 70% ethanol.

Species identifications were made using keys by Brown (1972), Hilsenhoff (1973), and White (1978). Voucher specimens are on deposit in the aquatic insect collection at the Department of Entomology, University of Maine at Orono.

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RESULTS

The distribution of species collected during this study is presented in Figures 1-4. Observations on distribution and habitat are summarized in Table I. Species not previously reported from Maine are preceeded by an asterisk.

DISCUSSION

In a study of the aquatic Dryopidea of Quebec, LeSage and Harper (1975) observed that the distribution of species was controlled by two factors: latitude and geologic formation. The influence of latitude was expressed as a decrease in the number of species from south to north. All species collected (31) occurred in the general area of the 45th parallel while only two persisted beyond the 50th.

A similar effect was observed for Maine species. With the exception of one, all species (27) occurred in an area generally approximating the 45th parallel. This number decreased in the northern extremes of the state (approximately the 47th parallel) where only 10 species were collected.

LeSage and Harper (1975) also noted that Quebec could be divided into three general regions based on the underlying geologic formation of each. These regions were: the Laurentian Highlands dominated by Pre-cambrian shield, the St. Lawrence Lowlands characterized by very old, undisturbed sedimentary formations, and the Appalachian Region characterized by greatly deformed metamorphic formations and massive igneous intrusions. Each region had distinctive water chemistry and contained a unique dryopoid fauna.

Only the Appalachian Region occurs in Maine. This region encompasses the south eastern areas of Quebec and extends eastward to include Maine, the Maritime provinces and the Gaspe Penninsula. Adjacent to Quebec, the north western area of Maine is dominated by mountains and displays considerable variability in elevation. The remainder of the state, while geologically similar, exhibits greatly reduced topographic variation.

Species collected during this study were placed into one of four groups depending on their abundance and distribution. The four groups were: upland species, lowland species, generally distributed species, and rare species. It is believed that the first two groups reflect the interaction of latitude and elevation.

Upland Species

Species placed in this category were collected primarily from the smaller head-water streams of the mountainous areas of northern and western Maine. Twelve species were taken in this region, however, only two *(Oulimnius latiusculus* (LeConte) and *Optioservus trivittatus* (Brown))

are considered to be typical of the area.

O. latiusculus was represented in the south eastern and coastal areas of the state by the collection of single specimens but displayed a marked increase in abundance toward the mountainous areas of the north west where it was the most frequently collected member of the superfamily. Due to this increasing gradient of abundance, *O. latiusculus* is considered to be an upland species.

O. trivittatus had a less extensive range by comparison but displayed a similar gradient of abundance. It was common in the north west and rare in the south eastern and coastal areas.

Lowland Species

All species except one occurred in the south eastern and coastal areas of the state. However, only nine species are considered to be typical of the region. These species include: *Ancyronyx variegata* (Germar), *Dubiraphia quadrinotata* (Say), *Dubiraphia minima* (Hilsenhoff), *Macronychus glabratus* (Say), *Promoresia elegans* (LeConte), *Promoresia tardella* (Fall), *Stenelmis concinna* (Say, and *Stenelmis mera* (Sanderson).

The more common species in this group displayed gradients similar to that of the upland species but with an opposite orientation. Lowland species were common in the south eastern and coastal areas and rare in the north western areas.

Generally Distributed Species

Three species *(Optioservus ovalis* (Le Conte), *Ectopria nervosa* (Melsheimer) and *Psephenus herricki* (DeKay)) were broadly distributed in the state but did not exhibit distinct gradients of abundance.

O. ovalis was common and frequently collected in most areas of the state.

E. nervosa was collected only as larvae and must therefore be considered a tentative identification. Specimens of this species were usually represented in collections by single larvae.

P. herricki was locally abundant but not frequently collected.

Rare Species

Thirteen species exhibited local distributions and were usually represented in collections by single specimens. These are listed in Table I as rare species and are included in the previous groups solely on the basis of geographic location.

A previously undescribed species of *Dubiraphia* has been collected (Mingo 1978) and appears to be restricted to a single location. Specimens have been taken on several occasions and are presently under study.

SUMMARY AND CONCLUSIONS

The distribution of dryopoid beetles in Maine appears to be controlled by the interaction of two factors: latitude and elevation. The role of geologic formation as described by LeSage and Harper (1975) can not be evaluated as only one major geologic type persists in the state.

The influence of latitude was expressed as a decrease in the number of species from south to north. All species, except one, occurred in the south eastern and coastal areas of the state while only 10 occurred in the northern most extremes.

The influence of latitude and elevation was reflected in two general distribution types: upland species typical of the north western mountainous areas, and lowland species typical of the lower elevations of the south eastern and coastal areas. The more common and widespread species in each group displayed a decrease in abundance toward the opposite regions.

Undoubtedly further investigation will reveal the presence of additional species, fill in distributional gaps and increase the ranges reported here. Eight species are reported from the state for the first time.

ACKNOWLEDGEMENTS

I wish to express my thanks and sincere appreciation to Dr. Harley P. Brown for verifying my determinations. Dr. Howard Y. Forsythe, Jr. and Dr. Eben A. Osgood critically reviewed the manuscript.

Special thanks to Ms. Jolene Walker for typing the manuscript.

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White, D.S. 1978. A revision of the nearctic *Optioservus* (Coleoptera: Elmidae), with descriptions of new species. Systematic Entomology 3: 59-74.

Table I. Distribution and Habitats of Dryopoid Beetles in Maine

	Distribution			Habitat	
	Upland	Lowland	General	Stream Size	Substrate
Dryopidae					
**Helichus basalis* LeConte		R		M	Wood
Helichus fastigiatus (Say)		R		M	Wood
**Helichus lithiophilus* (Germar)		R		M	Wood, Roots
Elmidae					
Ancyronyx variegata (Germar)		C		S M L	Wood
Dubiraphia minima Hilsenhoff		C		S M L	Vegetation, Wood, Moss
Dubiraphia quadrinotata (Say)		C		S M L	Vegetation, Wood,Moss
Dubiraphia vittata (Melsheimer)		R		S	Vegetation
Dubiraphia n. sp.		R		S	Vegetation
Macronychus glabratus (Say)		C		S M L	Wood, Roots
Microcylloepus pusillus LeConte		R		M	Wood
**Microcylloepus p. pusillis* LeConte		R		M	Wood
Optioservus ovalis LeConte			C	S M L	Gravel, Stones
Optioservus trivittatus (Brown)	C			S M L	Gravel, Stones
Oulimnius latiusculus (LeConte)	C			S M L	Sand, Gravel
Promoresia elegans (LeConte)		C		S M L	Vegetation, Gravel, Stones
Promoresia tardella (Fall)		C		S M L	Vegetation, Moss, Gravel, Stones
**Stenelmis concinna* Sanderson		C		S M L	Sand, Gravel, Stones
Stenelmis crenata (Say)		C		S M L	Wood, Gravel, Stones, Rubble
Stenelmis bicarinata LeConte	R			L	Stones, Rubble
**Stenelmis markeli* Motschulsky		R		S M L	Wood, Sand, Gravel
Stenelmis mera Sanderson		C		S M L	Gravel, Stones, Rubble
**Stenelmis mirabilis* Sanderson		R		S	Gravel, Stones
**Stenelmis musgravei* Sanderson		R		S	Gravel, Stones
**Stenelmis sandersoni* Musgrave		R		S M	Sand, Gravel Stones
Psephenidae					
Ectopria nervosa (Melsheimer)? (larvae only)			C	S M L	Wood, Stones, Rubble
Psephenus herricki (DeKay)			C	S M L	Wood, Stones, Rubble
Ptilodactylidae					
Anchytarsus bicolor (Melsheimer) (larvae only		R		S	Sand, Gravel with Wood

*new state record
?tentative identification

R rare species
C common species

S small streams
M medium streams
L large streams & rivers

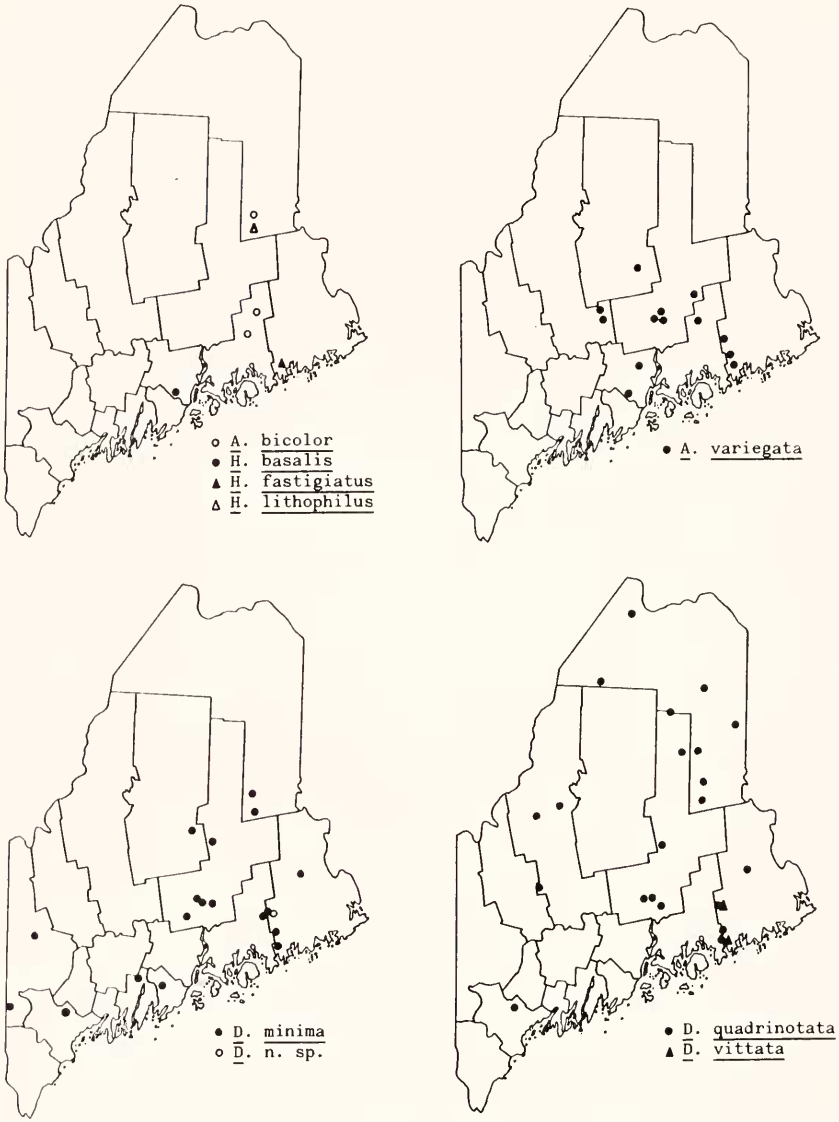
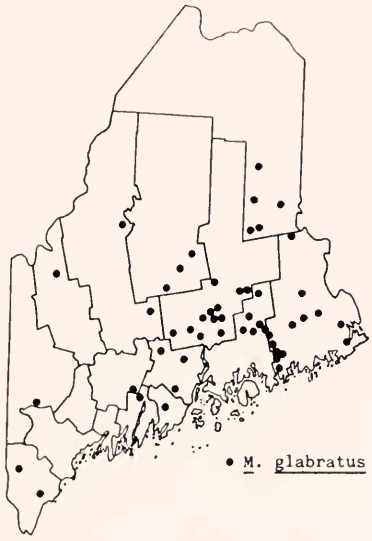
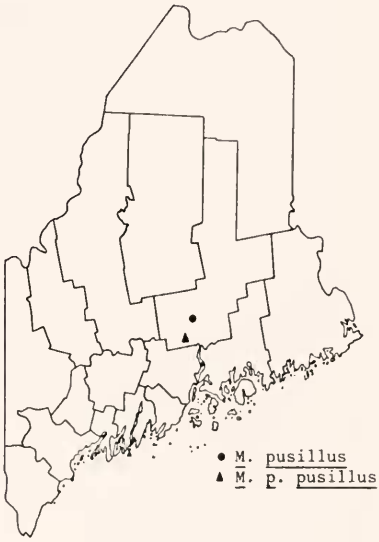
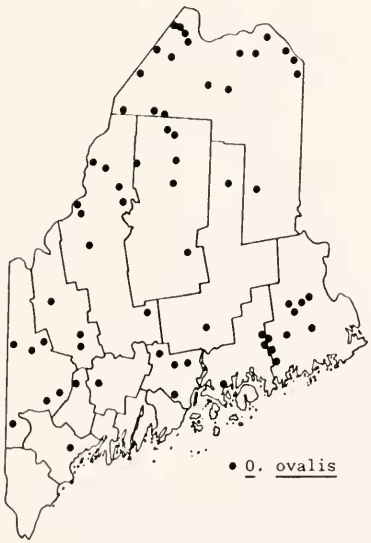


Figure 1. Distribution of Anchytarsus, Helichus, Ancyronyx, and Dubiraphia species in Maine.







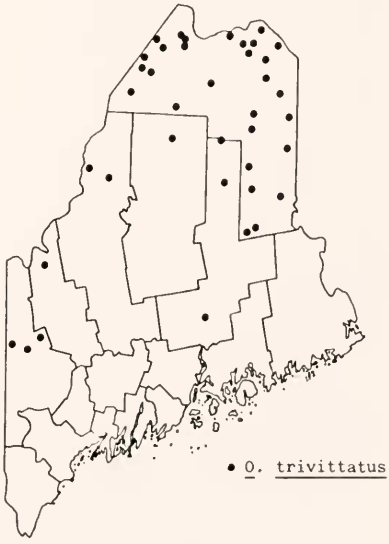


Figure 2. Distribution of Macronychus, Microcylloepus, and Optioservus species in Maine.

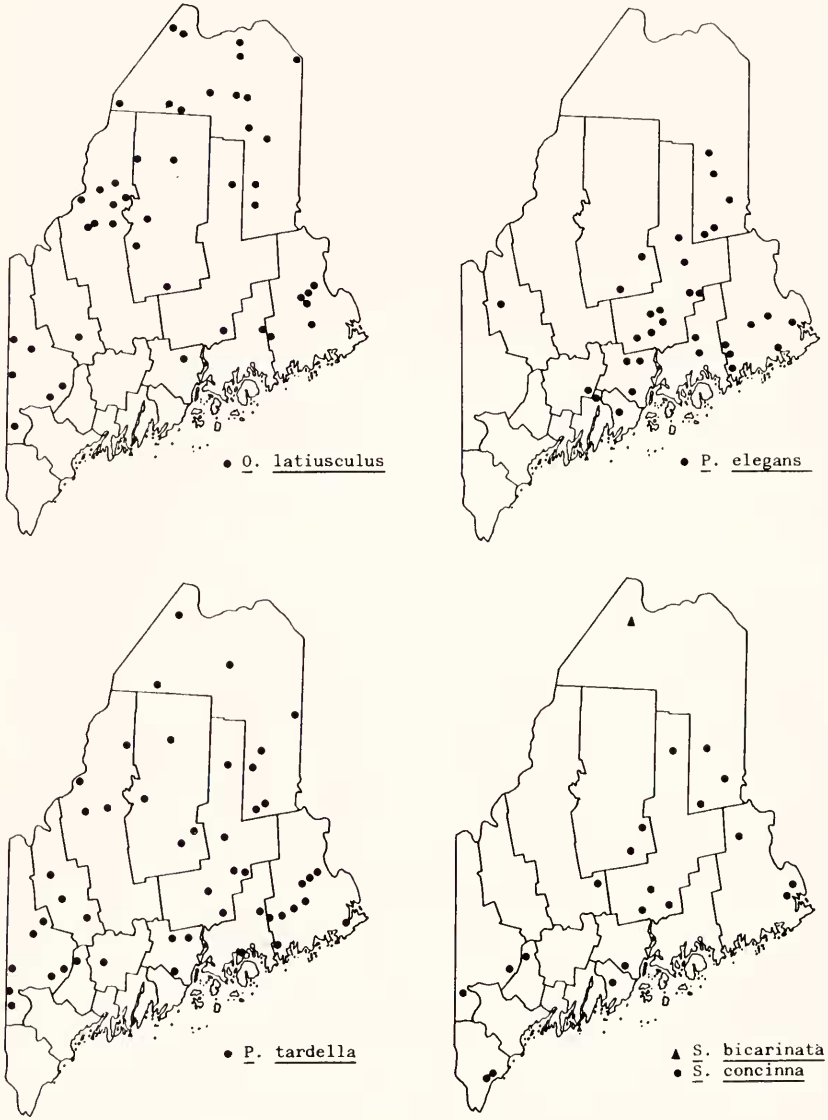


Figure 3. Distribution of Oulimnius, Promoresia, and Stenelmis species in Maine.

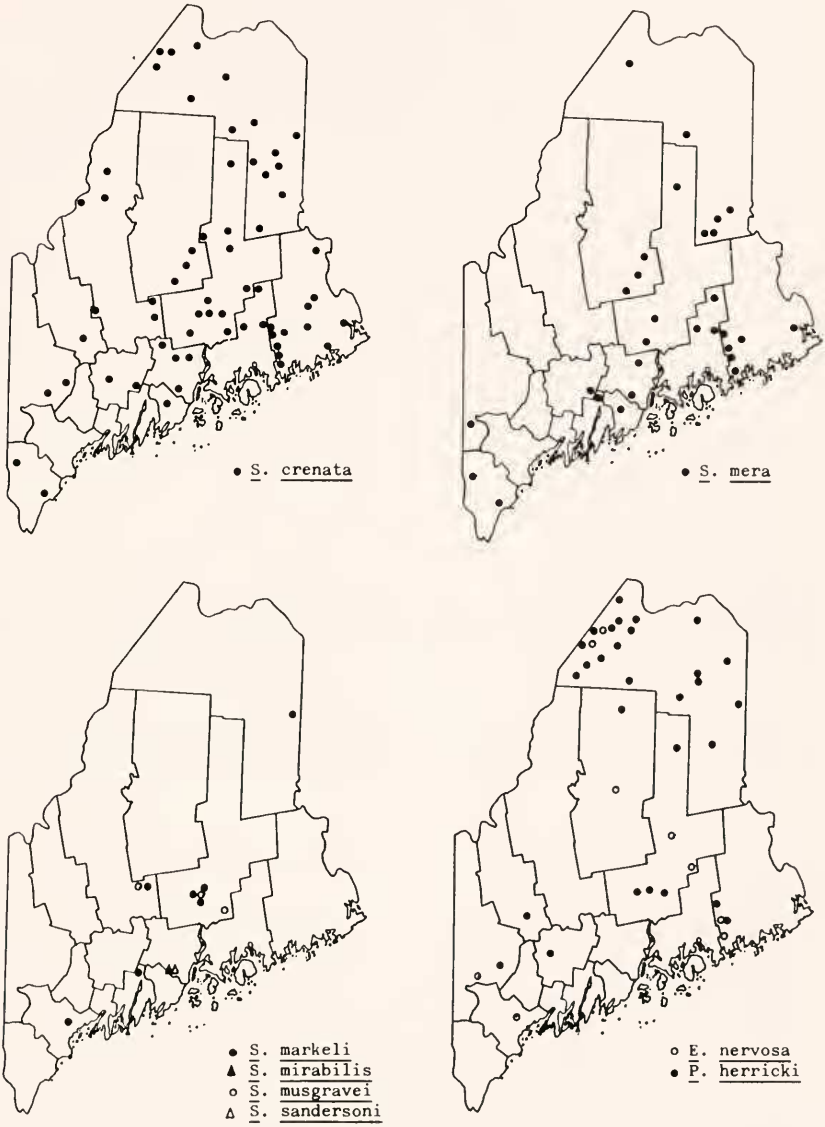


Figure 4. Distribution of Stenelmis, Ectopria and Psephenus species in Maine.

BOOKS RECEIVED AND BRIEFLY NOTED

ESSENTIAL INVERTEBRATE ZOOLOGY, 2nd ed. M.S. Laverack & J. Dando. Halsted Press, John Wiley & Sons. 1979. 194 pp. Ppbk. 8¼ x 9¼. Illus. $12.95.
Intended as a text for an introductory course on invertebrate phyla. Authors have attempted to condense known material on body form and organ functions of animals into a very concise form, so much so that Insecta is treated only briefly as a class and insect orders are completely omitted. Well illustrated.

ARTHROPOD PHYLOGENY WITH SPECIAL REFERENCE TO INSECTS. H. Bruce Boudreauz. John Wiley & Sons. 1979. 320 pp. $21.50.
Based on a course in entomology the author has taught for the past twenty years, this is a well organized text on the nature and origin of arthropods and insects. This book should be of real value in courses on insect evolution and phylogeny.

THE PREPARATION AND CURATION OF INSECTS. Annette K. Walker & Trevor K. Crosby, New Zealand Dep't. of Scientific & Industrial Research (DSIR) and Ent. Soc. of New Zealand. 1979 55 pp. $2.50. Obtain copies from Science Info. Div., DSIR, PO Box 9741, Wellington, N.Z. or Mrs. B.M. May, Distrib. Sec., Ent. Soc. of N.Z., 6 Ocean View Road, Huia, Auckland, N.Z.
This booklet explains methods and techniques for preparaing insects for an insect collection and how the collection should be curated and managed.

THE SEMIAQUATIC AND AQUATIC HEMIPTERA OF CALIFORNIA. Bulletin of the California Insect Survey, Vol. 21. Arnold S. Menke, ed. Univ. of California Press. 1979. 166 pp. Ppbk. 8¼ x 11. $16.00.
This manual is essentially an improved and updated treatment of Chapter 7 on Aquatic Hemiptera in Aquatic Insets of California, 1956, R.L. Usinger, ed.

A SURVEY OF THE LEPIDOPTERA, BIOGEOGRAPHY AND ECOLOGY OF NEW CALEDONIA. Series Entomologica vol. 15. J.D. Halloway. Dr. W. Junk B.V. 1979. 588 pp. $85.35.
A quantitative survey of the night-flying macrolepidoptera and an assessment of the Rhopalocera and microlepidoptera of New Caledonia, together with reviews of the geology, phytogeography and general zoogeography as background for the Lepidoptera fauna and its geography.

SOCIAL INSECTS. Vol. 1 Henry R. Hermann, ed., Academic Press. 1979. 437 pp. $36.00.
First of a three-volume treatise intended to collate the works of modern researchers working in the field of insect sociobiology. Vol. 1 incorporates modern theory with certain concepts of insect sociality, particularly through genetic, behavioral and evolutionary pathways..

BUMBLEBEE ECONOMICS. Bernd Heinrich. Harvard Univ. Press. 1979. 245 pp. 2 pls. $17.50.
Survival for the bumble bee depends, in part, on its ability to regulate body temperature through a complex energy exchange. It is this management of energy resources around which the author centers his discussion of physiology, behavior, and ecological interaction. Using bumblebees as the biological model, the central theme of this book is economics based on energetics.

TWO NEW SUBGENERA AND THREE NEW SPECIES OF *POLANA* (HOMOPTERA: CICADELLIDAE) FROM PERU AND COLUMBIA[1]

Dwight M. DeLong[2]

ABSTRACT: Two new subgenera, *Polana* subgenus *Striapona* and subgenus *Validapona*, and three new species, *P. (Striapona) desela* n. sp. (Peru), *P. (Validapona) lamina* n. sp. (Colombia) and *P. (Nihilana) quadrina* n. sp. (Colombia), are described.

The genus *Polana* was described by DeLong (1942). A synopsis of *Polana* treating 87 species was published by DeLong and Freytag (1972). Two additional species have been described by DeLong and Wolda (1978). Two new subgenera and three new species are described at this time.

Subgenus *Striapona,* n. subgen.

Type-Species *Polana (Stiapona) desela,* n. sp.

Crown produced, apex bluntly, roundly, angled margin thick, bluntly angled with front. Ocelli nearer anterior than posterior margin of crown and closer to eyes than to median line. Crown depressed behind thick anterior margin. Coronal margin, entire crown and central portion of pronotum marked with conspicuous, often deeply cut, transverse striae. Basal processes of male aedeagus quite broad.

The subgenus *Striapona* is closely related to the subgenus *Bohemanella* but the head is entirely different, crown more produced, with thicker margin and aedeagal processes different.

Polana (Striapona) desela, n. sp.
(Figs. 1-6)

Length of male 10mm, female unknown. Crown produced and rounded, twice as wide between eyes at base as median length. Ocelli nearer anterior than posterior margin and nearer to proximal eye than to median line. Crown depressed behind thick margin, bluntly angled with front. Coronal margin, entire crown and median portion of crown, especially disc, marked with conspicuous, often deep transverse striae. Color, face dark brown; crown dark brown to black. Pronotum pale brown, basal margin black, a large oval spot on disc dark brown, opaque, veins scarcely visible.

Genitalia of male with plates two and one-half times as long as median width, apices bluntly angled. Style with blade slightly narrowed on ventral margin near base, apex narrow and slightly recurved at tip. Aedeagal shaft rather short and robust, apex curved ventrally, tip rounded; basal processes rather broad, extending to apex of aedeagal shaft, apices in ventral view bluntly angled. Pygofer with caudal margin broad, rounded.

Holotype male, Iquitos Peru, XI., 1920 in the DeLong Collection.

[1]Received April 30, 1979.

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Subgenus *Validapona,* n. subgen.

Type-species *Polana (Validapona) lamina,* n. sp.

Head narrow, crown broadly rounded, almost parallel margined, scarcely produced, twice as broad at base between eyes as median length. Ocelli slightly nearer anterior than posterior margin of crown, twice as distant from median line as from proximal eye. Margin thick, but not rounded, dorsally as in *Polana.* Apical portion of aedeagal shaft with broad laminae extending laterally, aedeagus without basal processes. Pygofer with a long spear-like process, arising at base,extending ventrally, then caudally, along ventral margin to apex of pygofer.

Validapona is intermediate between *Curtara* and *Polana.* Viewed from above it appears related to *Curtara;* and from a lateral view, it appears as a *Polana.* The narrow head is more like species of *Polana.*

Polana (Validapona) lamina, n. sp.
(Figs. 7-12)

Length of male 13 mm, female unknown. Crown broad, rounded, almost parallel margined, twice as wide between eyes at base as median length. Ocelli closer to eyes than to median line. Crown without definite margin. Color crown pale, brown, darker brown at center. Pronotum pale brown with darker brown spots across basal area, a dark brown area on disc and apical margin dark brown. Scutellum brown with darker brown angles. Forewings white, heavily mottled with dark brown spots, veins brown.

Male genitalia with plates four times as long as median width, apices rounded. Style with apical portion of blade narrowed and curled. Aedeagal shaft narrowed, blunt at apex with thin scleritized plates extending laterally from apical portion of shaft. Continuous plate on apical third of ventral surface; two dorsal plates extend laterally from dorsal surface. Pygofer tapered and bluntly angled at apex, long slender sclerotized process arising on cephalad margin each side, extending ventrally then caudally beyond apex of pygofer.

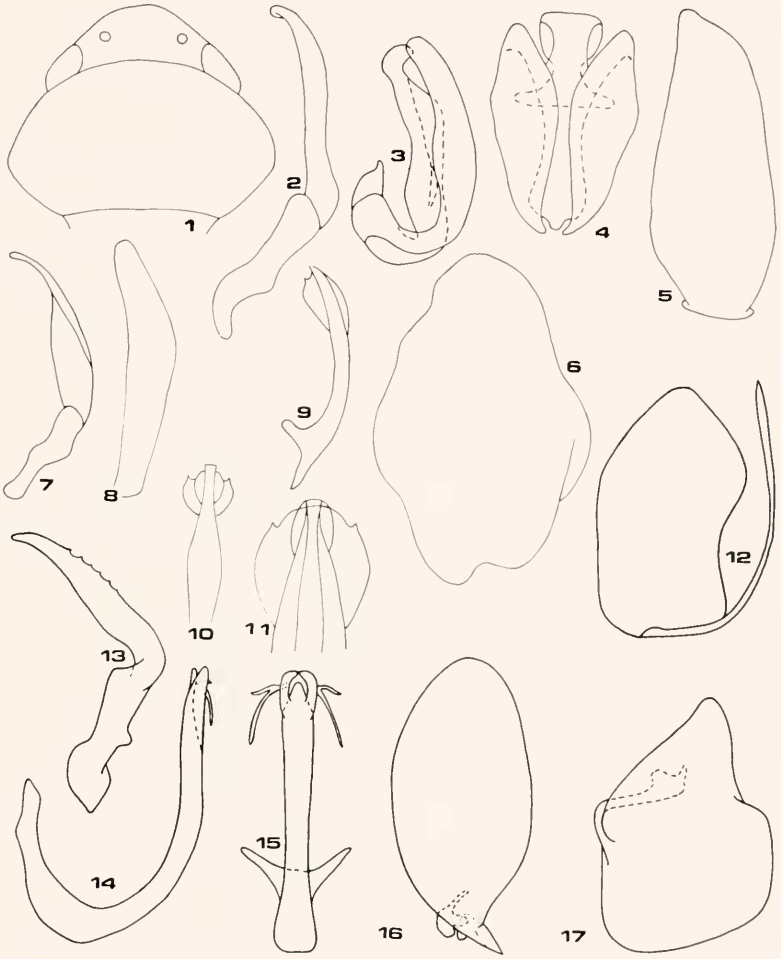
Holotype male, Colombia, Choco Dept., Camp Teresita, April 1967, in the DeLong Collection.

Polana (Nihilana) quadrina, n. sp.
(Figs. 13-17)

Length of male 9.5 mm., female unknown. Crown more than twice as wide between eyes at base than median length. Ocelli closer to eyes than to median line and closer to anterior margin than to base of crown. Color, clypeus and postclypeus pale brown. Crown, pronotum, and scutellum pale brown, caudal portion of pronotum and basal angles of scutellum darker brown. Forewings brown with two transverse rows, of 4 spots each, across wings. First row across middle of clavus with two spots on commissure and one spot on anterior portion of each discal cell. Second row across apex of clavus with two spots on commissure and one on caudal cross vein of each discal cell; veins brown.

Male plates broad, twice as long as median width, apices narrow and rounded. Style gradually narrowing from one-third its length to a narrow, bluntly pointed, dorsally curved apex; blade serrate on ventral margin of median third. Aedeagal shaft bluntly pointed at apex with two blunt subapical portions curving and contiguous beyond apex. A bifid lateral process arising from each subapical process curving laterad and basad. Each lateral process bifad near base; caudad portion one-fourth length of basad portion and extending laterally; basal portion extending basad. Pygofer with a spine-like process arising dorsally, extending basad more than half width of pygofer, subapically enlarged, apex narrow, pointed.

Holotype male labeled "Colombia, 1941 (L. Richter)" in the North Carolina State University collection.



Figs. 1-6 *Polana (Striapona) desela,* n.sp. 1. head and pronotum dorsally, 2. style laterally, 3.aedeagus laterally, 4. aedeagus ventrally, 5. plate ventrally, 6. pygofer laterally. Figs. 7-12. *Polana (Validapona) lamina,* n.sp. 7. style laterally, 8. plate ventrally, 9. aedeagus laterally, 10. aedeagus ventrally, 11. aedeagus ventrally, apical portion, 12. pygofer laterally. Figs. 13-17. *Polana (Nihilana) quadrina,* n.sp. 13. style laterally, 14. aedeagus laterally, 15. aedeagus ventrally, 16. plate ventrally, 17. pygofer laterally.

P. quadrina is related to *P. concinna* (Stal). These can be separated by the characters of the style and aedeagus as illustrated.

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DeLong, Dwight M. 1942. A Monographic Study of the North American Species of the Subfamily Gyponinae (Homoptera: Cicadellidae) exclusive of *Xerophloea*. Ohio State University, Graduate School Studies, Contrib. Zool., Entomol.No. 5. Biol. Series XIV 187: 35 pls.

_____ and Paul H. Freytag,1972, Studies of the World Gyponinae (Homoptera: Cicadellidae) The Genus *Polana* Arq. Zool. S. Paulo. 22(5):239-324.

_____and Henk Wolda 1978.New Species of *Polana* and *Curtara* (Gyponinae - Homoptera: Cicadellidae) from Panama. Ent. News 89: (9 & 10):227-230.

INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE

The Commission hereby gives six months notice of the possible use of its plenary powers in the following cases, published in *Bull. Zool. Nom.* vol. 35, part 4, May 31, 1979 and vol. 36, part 1, July 1, 1979 and will welcome comments and advice on them from interested zoologists. Correspondence should be addressed to the Secretary, I.C.Z.N., c/o British Museum (Natural History), Cromwell Road, London, SW7 5BD, United Kingdom.

2161 *Lethocerus* Mayr, 1853 (Hemoptera, Belostomatidae); proposed conservation in place of *Iliastus* Gistel (1847).

2234 *Lespesia* Robineau-Desvoidy, 1863; proposed designation of a type species under the plenary powers (Diptera, Tachinidae).

2255 *Tipula ferruginea* Fabricius, 1805 (Diptera, Tipulidae): proposed conservation.

2221 *"Staphylinus fulgidus"* as the type species of several nominal genera (Coleoptera, Staphylinidae).

The following opions have been published recently by the I.C.Z.N. in the same above isues of the *Bull, Zool. Nom.* The Commission regrets it can not supply separates of Opinions.

1118 (p. 212) Conservation of*Tribolbina carnegiei* Latham, 1932, (Acarchnida)

1119 (p. 216) *Amaurobisu* C.L. Koch, 1837, and *Coelotes* Blackwell, 1841 (Araneae): conserved under the plenary powers.

1120 (P 221) *Noctua armigera* Hubner, (1808) (Lepidoptera) conserved.

1125 (p. 22) *Ceratophyllus soricis* Dale, 1878. (Insecta: Siphonaptera); designation of a neotype under the plenary powers.